

Amendments to the Specification:

Please replace the paragraphs beginning at page 1, line 10 - page 3, line 1 with the following amended paragraphs:

As one form of piezoelectric/electrostrictive device, there ~~are~~is known a piezoelectric/electrostrictive device ~~of a form that~~ includes a base having a pair of right and left movable parts and a fixing part that connects the movable parts with each other at one end thereof ~~as well as and~~ a piezoelectric/electrostrictive element is disposed on at least one side of the movable parts of the base, ~~and~~ There is also known a piezoelectric/electrostrictive device ~~of a form that~~ includes a base having a pair of right and left movable parts, a fixing part that connects the movable parts with each other at one end thereof, and a mounting part that connects the movable parts with each other at the other end thereof ~~as well as and~~ a piezoelectric/electrostrictive element disposed on at least one side of the movable parts of the base, ~~as~~ The above-mentioned piezoelectric/electrostrictive devices are disclosed in the specification of European Patent EP1017116A2.

The piezoelectric/electrostrictive device of such a form has a function of operating the movable parts caused by the displacement operation of the piezoelectric/electrostrictive element or a sensing function of sensing the displacement of the movable parts input from the side that is sensed, with the use of the piezoelectric/electrostrictive element. By effectively using these functions, the piezoelectric/electrostrictive device is used in a wide range of fields, such as those described below.

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~~Namely, the piezoelectric/electrostrictive~~Piezoelectric/electrostrictive devices of such a form are used as active elements such as various transducers, various actuators, frequency region functional components (filters), transformers, vibrators and resonators for communication or mechanical power, oscillators, and discriminators, various sensor elements such as supersonic wave sensors, acceleration sensors, angular velocity sensors, impact sensors, and mass sensors, and various actuators that are put to use for displacement, positioning adjustment, and angle adjustment mechanism for various precision components of optical instruments and precision apparatuses.

~~Meanwhile, the piezoelectric/electrostrictive~~Piezoelectric/electrostrictive devices ~~of such a form is~~are formed typically by cutting a device master into a suitable size, and the device master is constructed by bonding a piezoelectric/electrostrictive element onto both of the front and rear surfaces of a base master via an adhesive, or is constructed by integrally forming these. Here, the base master is constructed by laminating and baking plural sheets.

Please replace the paragraphs beginning at page 3, lines 11 - 26 with the following amended paragraphs:

Also, in the case where the base is constructed with ceramics, one must adopt a hard ceramic material such as zirconia, since the ceramics are liable to be split. Even if a hard ceramic material is adopted, one must choose a suitable cutting condition ~~so as not to generate~~to prevent a loss of the material through nicks or cracks. Further, since the base is made of a hard ceramic material, the machining process is difficult to be designed and, in order to increase the number of machining products, one must give a careful

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consideration such as use of a large number of machining apparatuses having different functions.

The base can be constructed with a metal material. ~~however, the~~ The use of a metal material, however, gives rise to an oxidized end surface caused by friction heat during the cutting process and burrs ~~remained~~ remain on the processed end surface. ~~so that one must add~~ Consequently, another processing step of removing these must be added to remove the burrs. Further, the piezoelectric/electrostrictive device can be tested only after the device master is cut.

Please replace the paragraphs beginning at page 4, line 27 - page 6, line 9 with the following amended paragraphs:

The present invention relates to a piezoelectric/electrostrictive device and a method of producing the piezoelectric/electrostrictive device. The piezoelectric/electrostrictive devices according to the present invention are piezoelectric/electrostrictive devices provided in the following three types of forms.

A piezoelectric/electrostrictive device of the first form according to the present invention is a piezoelectric/electrostrictive device that includes a base having a pair of right and left movable parts and a fixing part that connects the movable parts with each other at one end thereof. ~~as well as a~~ A piezoelectric/electrostrictive element is disposed on at least one side of the movable parts of the base.

A piezoelectric/electrostrictive device of the second form according to the present invention is a piezoelectric/electrostrictive device that includes a base having a pair of

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right and left movable parts, a fixing part that connects the movable parts with each other at one end thereof, and a mounting part that is separate from the fixing part and connects the movable parts with each other at the other end thereof, ~~as well as a~~ piezoelectric/electrostrictive element is disposed on at least one side of the movable parts of the base.

A piezoelectric/electrostrictive device of the third form according to the present invention is a piezoelectric/electrostrictive device that includes a base having a pair of right and left movable parts, a fixing part that connects the movable parts with each other at one end thereof, a mounting part that is separate from the fixing part and connects the movable parts with each other at the other end thereof, and a connecting part that is integral with the mounting part and surrounds the mounting part, the movable parts, and the fixing part, ~~as well as a~~ piezoelectric/electrostrictive element is disposed on at least one side of the movable parts of the base.

~~Now, in~~ In the piezoelectric/electrostrictive device of the first form according to the present invention, the base is constructed with one sheet of flat plate; the fixing part has a flat plate shape; and the movable parts are erect by a predetermined height from side peripheries of the fixing part to face each other and extend beyond the other end of the fixing part along the side peripheries of the fixing part.

Please replace the paragraph beginning at page 11, lines 22-28 with the following amended paragraph:

~~Now, it~~ It is essential in the principle of operation that the fixing part or the fixing part and the mounting part are closely connected to the two flexible side peripheries.

Since these are integrally formed in the piezoelectric/electrostrictive devices according to the present invention, the most preferable modes are embodied in view of the principle of operation.

Please replace the paragraph beginning at page 13, lines 15-24 with the following amended paragraph:

~~It goes without saying that the~~ The piezoelectric/electrostrictive device of the third form according to the present invention can produce the functions and effects that are produced by the first and second piezoelectric/electrostrictive devices. In particular, since the third piezoelectric/electrostrictive device has a connecting part that is integral with the mounting part, the device provides a great advantage that the connecting part can be allowed to function as a gimbal for supporting the magnetic head (slider) of the hard disk drive.

Please replace the paragraphs beginning at page 15, line 11 - page 21, line 23 with the following amended paragraphs:

These and other objects, features, aspects, and advantages of the present invention will become more apparent from the following detailed description of the present invention when taken in conjunction with the accompanying drawings, in which;

Figs. 1A to 1K are perspective views respectively illustrating eleven types of embodiments of the piezoelectric/electrostrictive devices according to the present invention;

Fig. 2 is a perspective view illustrating a state in which a component to be controlled is mounted on the first piezoelectric/electrostrictive device of the second form according to the present invention;

Figs. 3A and 3B are a perspective view illustrating an original plate of a base constituting the first piezoelectric/electrostrictive device, and a perspective view illustrating the base formed by bending the original plate, respectively;

Figs. 4A and 4B are a perspective view illustrating a state of assembling the first piezoelectric/electrostrictive device, and a perspective view illustrating the assembled piezoelectric/electrostrictive device, respectively;

Figs. 5A and 5B are a perspective view illustrating an original plate of a base constituting the second piezoelectric/electrostrictive device of the second form according to the present invention, and a perspective view illustrating the base formed by bending the original plate, respectively;

Figs. 6A and 6B are a perspective view illustrating a state of assembling the second piezoelectric/electrostrictive device, and a perspective view illustrating the assembled piezoelectric/electrostrictive device, respectively;

Figs. 7A and 7B are a perspective view illustrating an original plate of a base constituting the third piezoelectric/electrostrictive device of the second form according to the present invention, and a perspective view illustrating the base formed by bending the original plate, respectively;

Figs. 8A and 8B are a perspective view illustrating a state of assembling the third piezoelectric/electrostrictive device, and a perspective view illustrating the assembled piezoelectric/electrostrictive device, respectively;

Figs. 9A and 9B are a perspective view illustrating an original plate of a base constituting the fourth piezoelectric/electrostrictive device of the second form according to the present invention, and a perspective view illustrating the base formed by bending the original plate, respectively;

Figs. 10A and 10B are a perspective view illustrating a state of assembling the fourth piezoelectric/electrostrictive device, and a perspective view illustrating the assembled piezoelectric/electrostrictive device, respectively;

Figs. 11A and 11B are a perspective view illustrating an original plate of a base constituting the fifth piezoelectric/electrostrictive device of the second form according to the present invention, and a perspective view illustrating the base formed by bending the original plate, respectively; Figs. 12A and 12B are a perspective view illustrating a state of assembling the fifth piezoelectric/electrostrictive device, and a perspective view illustrating the assembled piezoelectric/electrostrictive device, respectively;

Figs. 13A and 13B are a perspective view illustrating an original plate of a base constituting the sixth piezoelectric/electrostrictive device of the second form according to the present invention, and a perspective view illustrating the base formed by bending the original plate, respectively;

Figs. 14A and 14B are a perspective view illustrating a state of assembling the sixth piezoelectric/electrostrictive device, and a perspective view illustrating the assembled piezoelectric/electrostrictive device, respectively;

Figs. 15A and 15B are a perspective view illustrating an original plate of a base constituting the seventh piezoelectric/electrostrictive device of the seventh embodiment according to the present invention, and a perspective view illustrating the base formed by bending the original plate, respectively;

Figs. 16A and 16B are a perspective view illustrating a state of assembling the seventh piezoelectric/electrostrictive device, and a perspective view illustrating the assembled piezoelectric/electrostrictive device, respectively;

Figs. 17A and 17B are a perspective view illustrating an original plate of a base constituting the eighth piezoelectric/electrostrictive device of the first form according to the present invention, and a perspective view illustrating the base formed by bending the original plate, respectively;

Figs. 18A and 18B are a perspective view illustrating a state of assembling the eighth piezoelectric/electrostrictive device, and a perspective view illustrating the assembled piezoelectric/electrostrictive device, respectively;

Fig. 19 is a perspective view illustrating a state in which a component to be controlled is mounted on the first modification of the eighth piezoelectric/electrostrictive device;

Fig. 20 is a perspective view illustrating the second modification of the eighth piezoelectric/electrostrictive device;

Figs. 21A and 21B are a perspective view illustrating an original plate of a base constituting the ninth piezoelectric/electrostrictive device of the second form according to the present invention, and a perspective view illustrating the base formed by bending the original plate, respectively;

Figs. 22A and 22B are a perspective view illustrating a state of assembling the ninth piezoelectric/electrostrictive device, and a perspective view illustrating the assembled piezoelectric/electrostrictive device, respectively;

Figs. 23A and Fig. 23B are perspective views illustrating two examples of piezoelectric/electrostrictive elements adopted as the piezoelectric/electrostrictive element constituting the piezoelectric/electrostrictive device according to the present invention;

Figs. 24A and Fig. 24B are perspective views illustrating two other examples of piezoelectric/electrostrictive elements adopted as the piezoelectric/electrostrictive element constituting the piezoelectric/electrostrictive device according to the present invention;

Fig. 25 is a perspective view illustrating the first piezoelectric/electrostrictive device in which the piezoelectric/electrostrictive element shown in Fig. 24B is adopted as the piezoelectric/electrostrictive element;

Fig. 26 is a plan view illustrating a non-operating state of the piezoelectric/electrostrictive device of Fig. 25;

Figs. 27A and 27B are waveform diagrams respectively showing voltages applied to the two piezoelectric/electrostrictive elements of the piezoelectric/electrostrictive device of Fig. 25;

Fig. 28 is a plan view illustrating an operating state of the piezoelectric/electrostrictive device of Fig. 25;

Fig. 29 is a perspective view illustrating the first modification of the first piezoelectric/electrostrictive device;

Fig. 30 is a perspective view illustrating the second modification of the first piezoelectric/electrostrictive device;

Fig. 31 is a perspective view illustrating the tenth piezoelectric/electrostrictive device of the third form according to the present invention;

Figs. 32A and 32B are a perspective view illustrating an original plate of a base constituting the piezoelectric/electrostrictive device of Fig. 31, and a perspective view illustrating the base formed by bending the original plate, respectively;

Fig. 33 is a perspective view illustrating the eleventh piezoelectric/electrostrictive device of the third form according to the present invention;

Figs. 34A and 34B are a perspective view illustrating an original plate of a base constituting the piezoelectric/electrostrictive device of Fig. 33, and a perspective view illustrating the base formed by bending the original plate, respectively;

Fig. 35 is a perspective view illustrating a hard disk drive having the tenth piezoelectric/electrostrictive device mounted thereon; and

Figs. 36A and 36B are a plan view and a side view, respectively, of a suspension having the tenth piezoelectric/electrostrictive device mounted thereon.

DETAILED DESCRIPTION OF THE ~~PREFERRED EMBODIMENTS~~INVENTION

The piezoelectric/electrostrictive devices according to the present invention are: will now described. ~~A~~ a piezoelectric/electrostrictive device of the first form ~~that~~ includes a base having a pair of right and left movable parts and a fixing part that connects the movable parts with each other at one end thereof, ~~as well as and a~~ piezoelectric/electrostrictive element is disposed on at least one side of the movable parts of the base, ~~;~~ ~~a~~ A piezoelectric/electrostrictive device of the second form ~~that~~ includes a base having a pair of right and left movable parts, a fixing part that connects the movable parts with each other at one end thereof, and a mounting part that is separate from the fixing part and connects the movable parts with each other at the other end thereof, and ~~as well as a~~ piezoelectric/electrostrictive element is disposed on at least one side of the movable parts of the base, ~~A; and a~~ piezoelectric/electrostrictive device of the third form ~~that~~ includes a base having a pair of right and left movable parts, a fixing part that connects the movable parts with each other at one end thereof, a mounting part that is separate from the fixing part and connects the movable parts with each other at the other end thereof, and a connecting part that is integral with the mounting part and surrounds the mounting part, the movable parts, and the fixing part, and ~~as well as a~~ piezoelectric/electrostrictive element is disposed on at least one side of the movable parts of the base. Figs. 1A to 1K illustrate numerous embodiments (first embodiment to eleventh embodiment) of the piezoelectric/electrostrictive devices of various forms.

Please replace the paragraph beginning at page 28, lines 13-21 with the following amended paragraph:

~~Now, referring~~ Referring to Fig. 8B, the third piezoelectric/electrostrictive device 10c is made of a base 14 and a pair of piezoelectric/electrostrictive elements 12a, 12b. Base 14 is constructed with a pair of right and left long and narrow plate-shaped movable parts 14a, 14b, a flat plate-shaped fixing part 14c that connects the movable parts 14a, 14b with each other at one end thereof, and a flat plate-shaped mounting part 14d that connects the movable parts 14a, 14b with each other at the other end thereof.

Please replace the paragraph beginning at page 29, lines 14-23 with the following amended paragraph:

~~Here, as~~ As means for forming thin parts 14a1, 14b1 of original plate 14A, one can adopt a method of reducing the thickness by partially removing the material using chemical etching, microblasting, ion-milling, or the like, or a method of reducing the thickness by cutting through grinding, or the like method. Further, as a special means, one can adopt a plate formed by superposing and bonding one plate that has been drilled to have a hole of a predetermined length onto the other plate without a hole to substitute the site corresponding to the hole for the thin parts, as an original plate.

Please replace the paragraph beginning at page 32, lines 10-18 with the following amended paragraph:

~~Here, in~~ In the fifth piezoelectric/electrostrictive device 10e, reinforcing parts 16f, 16g are bonded to neither fixing part 16c nor mounting part 16d; however, reinforcing parts 16f, 16g are more preferably bonded to fixing part 16c and mounting part 16d. As the bonding means therefor, one can adopt a bonding means such as spot welding, press-bonding, caulking, soldering, brazing, or using an adhesive such as epoxy resin or UV-curing type resin or the like. Among these bonding means, spot welding is especially preferable.

Please replace the paragraph beginning at page 34, lines 7-22 with the following amended paragraph:

~~Now, referring~~ Referring to Fig. 16B, the seventh piezoelectric/electrostrictive device 10g is made of a base 18 and a pair of piezoelectric/electrostrictive elements 12a, 12b. Base 18 is constructed with a pair of right and left long and narrow plate-shaped movable parts 18a, 18b, a flat plate-shaped fixing part 18c that connects the movable parts 18a, 18b with each other at one end thereof, and a flat plate-shaped mounting part 18d that connects the movable parts 18a, 18b with each other at the other end thereof. Fixing part 18c protrudes for a predetermined length from one ends of movable parts 18a, 18b, and mounting part 18d protrudes for a predetermined length from the other ends of movable parts 18a, 18b. Therefore, fixing part 18c and mounting part 18d are an enlargement of fixing part 11c and mounting part 11d in base 11 of the first piezoelectric/electrostrictive device 10a, thereby ensuring a larger area.

Please replace the paragraph beginning at page 35, lines 22-29 with the following amended paragraph:

~~Now, referring~~ Referring to Fig. 18B, the eighth piezoelectric/electrostrictive device 20a is made of a base 21 and a pair of piezoelectric/electrostrictive elements 22a, 22b. Base 21 is constructed with a pair of right and left long and narrow plate-shaped movable parts 21a, 21b and a flat plate-shaped fixing part 21c that connects the movable parts 21a, 21b with each other at one end thereof. However, a mounting part is not provided on the other ends of movable parts 21a, 21b.

Please replace the paragraph beginning at page 38, line 17- page 39, line 3 with the following amended paragraph:

~~Here, in this~~ In the assembled structure, since the component to be controlled is sandwiched between the two movable parts 21a, 21b, the interval between the inner surfaces 21a1, 21b1 on the tip end side of movable parts 21a, 21b must be set substantially equal to the width dimension including the width of the component to be controlled and the thickness of the intervening adhesive layer. If this is neglected, when the interval between the inner surfaces 21a1, 21b1 on the tip end side of movable parts 21a, 21b is too narrow, the component cannot be placed between the inner surfaces 21a1, 21b1 on the tip end side of movable parts 21a, 21b, thereby making the assemblage

impossible, whereas if the interval between the inner surfaces 21a1, 21b1 on the tip end side of movable parts 21a, 21b is too wide, the component to be controlled cannot be bonded to both of the inner surfaces 21a1, 21b1 on the tip end side of movable parts 21a, 21b, thereby making the assemblage impossible.

Please replace the paragraph beginning at page 42, lines 12- 20 with the following amended paragraph:

~~Now, referring~~ Referring to Fig. 22B, the ninth piezoelectric/electrostrictive device 20b is made of a base 23 and a pair of piezoelectric/electrostrictive elements 22a, 22b. Base 23 is constructed with a pair of right and left long and narrow plate-shaped movable parts 23a, 23b, a flat and narrow plate-shaped fixing part 23c that connects the movable parts 23a, 23b with each other at one end thereof, and a flat and narrow plate-shaped mounting part 23d that connects the movable parts 23a, 23b with each other at the other end thereof.

Please replace the paragraph beginning at page 66, lines 8-19 with the following amended paragraph:

~~Now, referring~~ Referring to Fig. 36, the tenth piezoelectric/electrostrictive device 20e has a magnetic head 47 (slider) fixed onto the fixing part 24c of the base 24 via an adhesive, and is fixed by means of spot welding or the like to the rear side of the suspension 45 on the rear side of the mounting part 24d side in the connecting part 24e of the base 24. In such a mounting structure of the tenth piezoelectric/electrostrictive device 20e, the connecting part 24e of the base 24 has a function of a conventional gimbal, thereby providing an advantage that the use of a conventional gimbal can be omitted in mounting the tenth piezoelectric/electrostrictive device 20e onto the suspension 45.